

METHOD FOR PRODUCING A CLIP-ON FASTENING SYSTEM AND
CORRESPONDING CLIP-ON FASTENING SYSTEM

This invention relates to a method for producing a clip-on fastening system according to the preamble of Patent Claim 1 and a clip-on fastening system itself.

Connections between components are needed in many areas of technology. In addition to tight connections, detachable connections are frequently also desired in order to be able to separate the components from one another again as needed after they have previously been joined. Such detachable connections are used, for example, to attach a vehicle body to a sealing profile which is arranged in the area of openings provided in the vehicle body for windows, doors, sliding sunroofs or the like.

By using a detachable connection, it is possible in such cases, for example, to replace a damaged sealing profile which is subject to wear after a long period of time with a new sealing profile.

Detachable connections are implemented in practice by a clip-on fastening system, whereby a fastening element that functions as the base part of the clip-on fastening system is connected in a non-positive manner to a substrate, said fastening element providing a detachable clip-on fastening of the substrate, e.g., a vehicle body, to a component, e.g., a gasket. The component is provided with a clip area, whereby the fastening element has a cross-sectional shape which corresponds to the clip area of the component. To produce the detachable connection, the component is clipped onto the fastening element with the clip area in the manner of a catch connection.

Such a clip-on fastening system and a method for producing same have already been described in German Patent

DE 198 09 537 C2 on which the present invention is based according to the preamble of Patent Claim 1.

The known method is based primarily on the production of the fastening element that functions as the base part of the clip-on fastening system, whereby a strand of material of a molding compound that is not yet hardened is applied to the substrate. The molding compound is selected with regard to its material properties so that it does not run after application and it can be brought into an adhesive bond with the substrate and hardens to form the fastening element.

When applied, the strand of material mentioned above is guided through a guide element which has a cross section that matches the cross-sectional shape of the fastening element to be produced, using a shaping element which has a mushroom-shaped cross section.

The molding compound of the strand of material mentioned above thus does not run on the substrate after application and the molding compound forms an adhesive bond with the substrate. During the development of this adhesive bond, the material strand hardens to form the fastening element, so that then the base part of the clip-on fastening system is completely produced. Then the additional desired component, e.g., the sealing profile, can be clipped and detachably attached to the hardened fastening element.

Essentially the known method for producing the known fastening element and the corresponding clip-on fastening system have proven to be very useful, but it has been found in daily practice that there are still certain disadvantages. If the molding compound of the strand of material in the production of the known fastening element is to be selected so that it does not run on the substrate after being applied to the substrate, this constitutes a

restriction with respect to the material of the molding compound. Therefore, thermoplastic materials are not suitable because of their lack of stability. Instead, this method is limited to materials which are comparatively expensive in comparison with standard materials.

In the state of the art, the materials used for production of the fastening element are necessarily elastic. The Shore hardness is usually between 30 and 80 Shore A. Therefore, however, the size of the fastening element is limited in that small dimensions of the fastening element are impossible because harder materials are required for it. On the other hand, however, there is the demand for space-saving and weight-saving clip-on fastening systems in general and especially in motor vehicles.

In the production of the known fastening element, the material of the strand of material, i.e., the molding compound, is selected so that it will not run after application, but in practice it has been found that the strand of material has comparatively great tolerances with respect to the desired cross-sectional shape in application to substrates. However, if the cross-sectional shape has deviations as seen over the length of the strand of material, then this can have a negative effect on the function of clipping to the other component, e.g., the gasket. This is due to the fact that after the strand of material has been discharged from the guide element, it is impossible in the manufacture of the known fastening element to perform a continuous calibration in one calibration operation, so that it would be possible to ensure that an exact cross-sectional profile of the strand of material, i.e., the fastening element, is maintained. Since this possibility does not exist in the state of the art, there are comparatively great tolerances with regard to the cross-sectional profile of the fastening element. In the extreme case, this may even result in the production of

defective parts that cannot be used in the manufacture of the fastening element.

The object of this invention is to produce a clip-on fastening system according to the preamble of Patent Claim 1 in which the disadvantages described above are avoided and which will permit an even more reliable and secure but detachable fastening of components to one another.

This object is achieved with the method defined in the preamble of Patent Claim 1 through the characterizing features of Patent Claim 1.

In this invention, the fastening element is prefabricated and produced in an extrusion method as a continuous profile that is already hardened. A comparatively hard material is used here. The fastening element prefabricated and hardened in this way is glued to the substrate as needed, i.e., when the clip-on fastening system is to be produced, and then the component is clipped onto the fastening element with the clipping area.

The basic idea of this invention is that a fastening element that functions as the base part of the clip-on fastening system is to be prefabricated and manufactured separately as a continuous profile. Unlike the state of the art, because of this separate prefabrication it is possible to rely on standard types of materials which are less expensive for the fastening element.

In this invention, the fastening element is produced as a precursor product in a separate operation, so a higher speed can be maintained in the corresponding extrusion process in comparison with the known process in which a strand of material of a molding compound that has not yet hardened is applied to the substrate immediately after its discharge from the guide element to establish an adhesive

connection to the substrate. Instead, with this invention, a substrate that functions as the base may be formed as a continuous strip by free extrusion and then there is the possibility of rolling up the continuous profile thus produced to form a roll and storing it temporarily until later use.

Another advantage of this invention is that there are no longer any restrictions with regard to the choice of the materials. Thus, hard materials can be used for the fastening element with the desired cross-sectional shape, so that this yields space-saving and weight-saving solutions. Due to the free choice of materials, there is also a choice of different adhesive options if the fastening element is brought into a non-positive connection to the substrate to establish the detachable connection between the respective components.

When the fastening element that serves as the base part of the clip-on fastening system is prefabricated as a separate precursor product according to this invention, there is also the advantage that the desired cross-sectional shape of the fastening element can be checked by a calibration process and thus only minor tolerances or even none at all can be achieved over the length of the continuous profile. This is important in particular when small dimensions of the fastening element and of the corresponding clipping area of the other component are desired for reasons of space and weight. In the case when production of the fastening element possible according to this invention is made by a downstream calibration process, the fastening element can be manufactured with a very high precision and thus can also be designed to be much smaller.

In an expedient embodiment of this invention, the hardened continuous profile is produced in-line with the process step of gluing the fastening element onto the substrate. In

addition, however, it may also be advantageous to first temporarily store the prefabricated continuous profile in a roll and then to unwind the continuous profile from the roll onto the substrate for the purpose of gluing it there. In another expedient embodiment of this invention, the continuous profile is pressed against the substrate with a pressure roller when being glued to the substrate. This achieves a particularly secure non-positive connection to the substrate.

Another advantageous embodiment of this invention consists of applying a double-sided adhesive tape to the underside of the continuous profile. This makes it possible to achieve a good adhesive bond of the fastening element to the substrate in a simple manner.

According to another expedient embodiment of this invention, an adhesive is applied to the underside of the continuous profile to establish the desired adhesive bond. It is also likewise possible to apply an adhesive to the underside of the continuous profile as well as to the substrate.

According to another advantageous embodiment of this invention, the continuous profile on the surface to be glued is heated shortly before bringing it in contact with the substrate. This is expedient when the fastening element and/or the continuous profile is made of a material which forms a bond with the substrate when heated. However, it is also possible to apply a line of hot-melt adhesive to the continuous profile immediately before bringing it in contact with the substrate, in which case the hot-melt adhesive then forms a bond when heated and creates an adhesive bond between the continuous profile and the substrate.

In an advantageous manner, a thermoplastic material or a

thermoplastic elastomer is used as the material for the fastening element. Polyurethane has also proven to be a suitable material.

According to another embodiment of this invention, a hard material is used as the material for the clip area, as is also the case with the continuous profile. The advantage of this measure is that a very secure clip-on fastening system can be created in this way. First, the cross-sectional profiles of the fastening element and the clip area can be manufactured practically without any tolerance and thus with an extremely high precision, and second, because of the hard material, comparatively small dimensions can be produced. If a component is to be clipped with its clip area onto the fastening element under these conditions, the result is a very stable detachable connection.

A material with a hardness of at least 40 Shore D, preferably 45 Shore D, has proven expedient for the fastening element and/or the clip area of the component. The further embodiment of this invention according to which the component, e.g., the gasket itself, for example, is also prefabricated as a continuous profile has proven to be especially advantageous.

It may be advantageous to use a robot for fully automatic application of the fastening element to the substrate and bonding it to the substrate and/or clipping the component to the fastening element, thus further simplifying the production of the detachable connection.

A mushroom-shaped cross section has proven expedient for the fastening element, in which case the clip area then has a corresponding cross-sectional shape. Conversely, however, the clip area can also be produced with a mushroom-shaped cross section, and the cross-sectional shape of the fastening element is then designed to correspond

conversely. In addition, other cross-sectional shapes are also conceivable. The only deciding factor is that the two elements involved, namely the fastening element and the component and/or the clip area, are designed to have a corresponding cross section so as to permit clipping, i.e., a detachable connection.

Since there is greater freedom of choice with regard to the choice of materials and the material for the fastening element in this invention than in the state of the art, in practice a suitable adhesive system can be found for each substrate surface. This results in a much greater flexibility of the clip-on fastening systems according to this invention.

Moreover, when using this invention, the continuous profile can also be manufactured and fabricated by a supplier. The producer itself does not need to have an extruder to apply the fastening element. This leads to a lower investment cost and smaller space requirements.

Other advantages and expedient embodiments of this invention are derived from the subclaims and the following description.

This invention is explained in greater detail below on the basis of the drawing, in which:

- Fig. 1 shows a cross-sectional view of a fastening element attached to a substrate,
- Fig. 2 shows a cross-sectional view of a finished clip-on fastening system,
- Fig. 3 shows a schematic cross-sectional view to illustrate gluing a prefabricated fastening element to a substrate and

Fig. 4 shows another embodiment of this invention.

Fig. 1 shows a fastening element 2 which has a mushroom-shaped cross section. The fastening element 2 is prefabricated as a continuous profile. The fastening element 2 is attached with double-sided adhesive tape 3 in a non-positive manner to a substrate 1, e.g., a vehicle body part.

Fig. 2 shows a gasket 4 which forms a component that is detachably connected to the fastening element 2. The gasket 4 includes a clip area 5, which may be made of a different material than the gasket 4 itself. The cross-sectional shape of the clip area 5 corresponds to the cross-sectional shape of the fastening element 2, and Fig. 2 illustrates the state in which the gasket 4 is clipped in the manner of a catch connection to the fastening element 2, thereby establishing the desired detachable connection.

The clip area 5 and the fastening element 2 are preferably made of a hard material having a hardness of approximately 45 Shore D. Like the fastening element 2, the gasket 4 with the clip area 5 can also be manufactured as a precursor product, and it is therefore possible to maintain extremely low tolerances with regard to the cross-sectional shapes of the fastening element 2 as well as the clip area 5. The prefabrication can be performed to a very high precision. Because of the low tolerances, the fastening element 2 can be manufactured with small dimensions. In combination with the hard material and the precision thus achieved in clipping, this yields a very secure detachable connection. Fig. 3 illustrates how the fastening element 2 which is prefabricated as a continuous profile is applied to the substrate 1. To this end, the fastening element 2 is unrolled from a roll (not shown) and supplied via a feed system 7 in the direction of the substrate 1.

A double-sided adhesive tape 3 has been applied to the bottom side of the fastening element 2, and by means of the pressure roller 6, which is connected to the feed system 7 via a connection 8, the fastening element 2 is pressed with the double-sided adhesive tape 3 in the direction of the force F onto the substrate 1 and is thus brought into an adhesive bond.

Fig. 4 shows another embodiment of a clip-on fastening system. No gasket is used as component 4 here but instead a molded part frame is used. The arrangement according to Fig. 4 is frequently used in framing vehicle windows.

In the production of the molded part frame which forms the component 4, it is not possible to select the clip area to be made of another hard material because, molded part frames are usually made of rubber, soft PVC, polyurethane or TPE with a Shore A hardness of 30 to 90. Unlike the depictions in Figs. 1 through 3, there is thus no separate clip-on area in the embodiment according to Fig. 4.

In the area of the detachable connection, the component 4 is designed with a mushroom-shaped cross section, and the fastening element here, in contrast with that in Fig. 1, has a shape corresponding to the mushroom-shaped cross section. According to this invention, the fastening element 2 is prefabricated as a continuous profile made of a hard material.

List of Reference Notation

- 1 substrate
- 2 fastening element
- 3 double-sided adhesive tape
- 4 component
- 5 clip area
- 6 pressure roller
- 7 feed system
- 8 connection